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THE FIRST MYGALOMORPH SPIDER WITHOUT SPERMATHECAE: *SICKIUS LONGIBULBI*, WITH A REVALIDATION OF *SICKIUS* (ARANEAE, THERAPHOSIDAE, ISCHNOCOLINAE)

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ABSTRACT. The monotypic Brazilian genus *Sickius* Soares & Camargo 1948 is revalidated, rediagnosed, and tentatively transferred to the Ischnocolinae. The formerly unknown female of *S. longibulbi* Soares & Camargo 1948 is found to lack spermathecae. This unusual genital feature, not found in any other mygalomorph spider species, is described and discussed.

Keywords: *Sickius longibulbi*, Theraphosidae, Ischnocolinae, spermathecae, spider taxonomy

Soares & Camargo (1948) described the genus *Sickius* and the only species *S. longibulbi* Soares & Camargo 1948 based on a single male specimen from the eastern border of Rio das Mortes, Chavantina, State of Mato Grosso, Brazil. Raven (1985) placed it in synonymy with *Hapalotremus* Simon 1903 because it shares the conformation of the tibial spur and the associated bent metatarsus. However, the type was not located at that time (Raven 1985) and the synonymy was based on the original taxonomic description and published figures. No other study has been done so far on the genus.

Recent searches by the authors in the arachnid collections of Museu de Zoologia da Universidade de São Paulo resulted in the rediscovery of the holotype of *Sickius longibulbi*. Furthermore, collecting in several Brazilian localities resulted in many specimens belonging to this species, which allow us to revalidate the genus *Sickius* as well as to describe the so far unknown female of *S. longibulbi*. Unexpectedly, this species was found to lack spermathecae, a feature only found in a few spider species (Forster 1980; Uhl 1994), none of them belonging to the Mygalomorphae. The morphology of the female genital organ was carefully examined and described.

METHODS

Specimens are deposited in the following institutions: Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (MZUSP, Carlos Roberto F. Brandão); Instituto Butantan São Paulo, Brazil (IBSP, Rogerio Bertani); Universidade de Brasília, Brasília, Brazil (UNB, Paulo Cesar Motta).

For genitalia and reproductive system studies, nine females preserved in 80% alcohol and one fresh dead specimen had their genitalia and reproductive organs (ovaries, oviducts, uterus internus and uterus externus) completely dissected under a stereoscopic microscope. Of these, two females had their genital tract examined in order to look for the site of sperm deposition: a preserved female was examined with large abdomen and well-developed oocytes, which was considered a sign of pregnancy; and another female was sacrificed and dissected 18 hours after copulation. Ovaries, oviducts, uterus internus and uterus externus were examined under a stereomicroscope and samples of structures resembling coenospermia were taken from oviducts and uterus internus lumen and mounted on slides. These structures were then analyzed and photographed with a Zeiss Axiophot light microscope.

In order to search for spermathecae in cast skins, exuvia of three specimens kept in the laboratory for three years and another seventy specimens kept for nine months were examined, reaching a total of 90 exuvia.

SEM micrographs of internal genitalia of

subadult male casting skin, and of a preserved female were taken after being sputter-coated with gold, and examined in a Zeiss DSM 940. Measurements are in mm.

The terminology used for legs spination is based on Petrunkevitch (1925), with modifications. The total number of spines were expressed for basal, median and distal regions on each article side (p = prolateral, r = retrolateral, v = ventral). Those spines on edges of distal sides are identified as "ap" to differentiate these spines, commonly concentrated on the distal article edges, from other spread over the distal area.

TAXONOMY

Genus *Sickius* Soares & Camargo

Sickius Soares & Camargo 1948:405; type species: *Sickius longibulbi* Soares & Camargo 1948; by original designation.—Brignoli 1983:140.

Hapalotremus Simon: Raven 1985:151 (synonymy, here rejected).—Platnick 1989:103.

Diagnosis.—Males can be distinguished from other ischnocolines by the characteristic shape of the male palpal bulb and tibial spur (Figs. 1–5) as well as by the presence of a metatarsal ventral spur (Figs. 4, 5). Females can be distinguished by the absence of spermathecae.

Description.—See description of type species.

Sickius longibulbi Soares & Camargo
Figs. 1–9

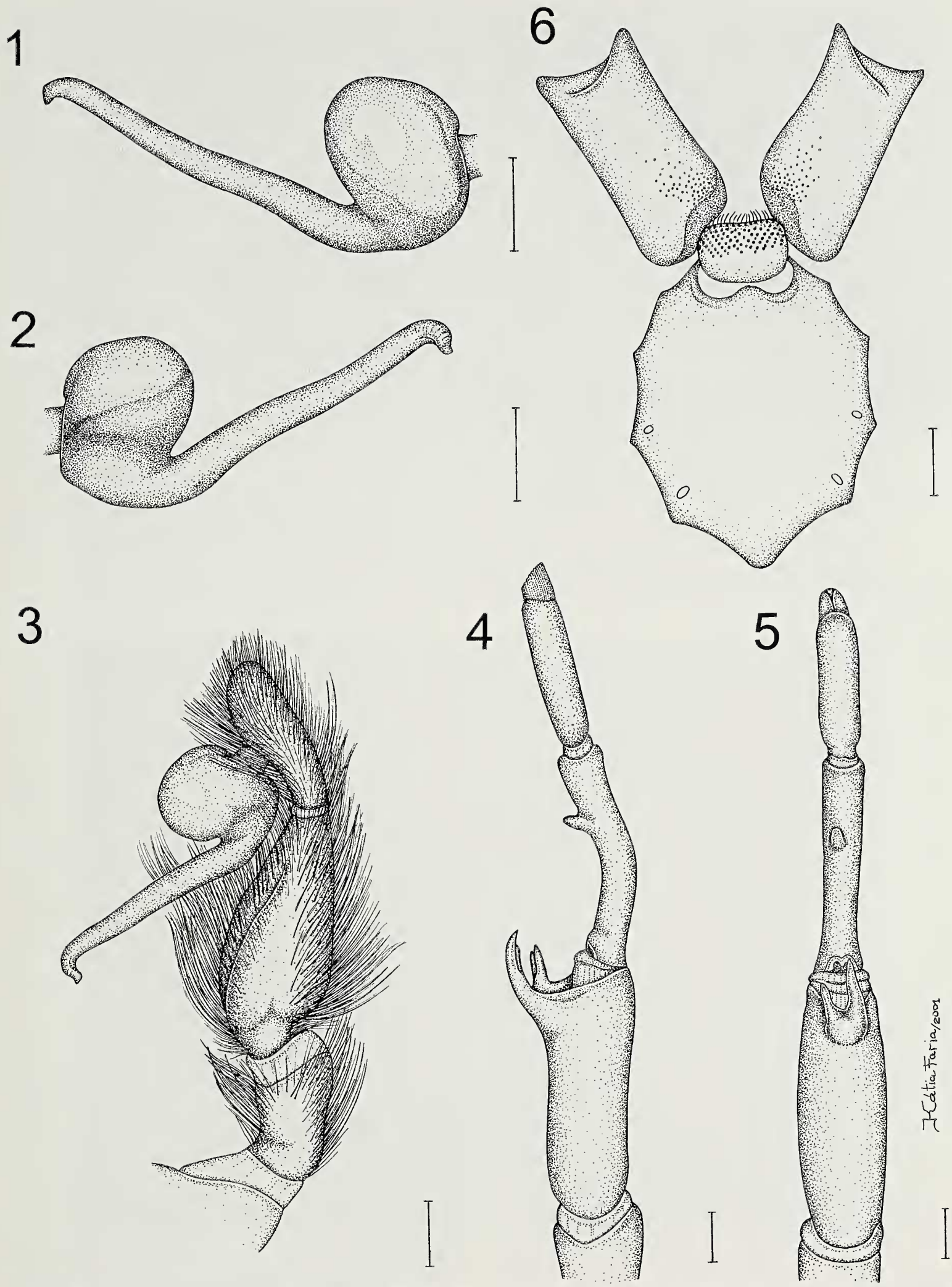
Sickius longibulbi Soares & Camargo 1948:406, figs. 86–88, holotype male from eastern border of Rio das Mortes, State of Mato Grosso, Brazil, H. Sick collected, September/December 1946 deposited at MZUSP, No. E.814 C.1248, examined. Brignoli 1983:140.

Hapalotremus longibulbi: Raven 1985:151.

Diagnosis.—See diagnosis for the genus.

Description.—*Male:* (IBSP 8019, Paranaíba, Mato Grosso do Sul, Brazil, 3 November 1983, R.R. Silva). Total length with chelicerae: 22.0. Carapace: length 9.1, width 7.8. Eye tubercle: length 1.0, width 1.4. Labium: length 1.0, width 1.5. Sternum: length 4.0, width: 3.6. Cephalic region very low, hardly distinct. Thoracic striae undistinguishable. Fovea short, shallow, slightly recurved. Chelicerae without rastellum, basal segments with 9–10 teeth on promargin. Clypeus absent. Anterior eye row procurved, posterior straight. Anterior median eyes rounded, same size as oval anterior lateral eyes. Posterior lateral and posterior median eyes oval, subequal, both shorter than anterior median and anterior lateral eyes. Labium with almost 100 cuspules on its anterior half. Maxilla subrectangular, anterior lobe distinctly produced into conical process, inner angle bearing numerous cuspules (> 50). Labiosternal suture broad. Sigilla: anterior pair not evident; second pair hardly visible; other very small, shallow, positioned about one diameter from margin. Posterior median spinnerets one-segmented, short; posterior lateral spinnerets three-segmented, basal segment shorter than median, both shorter than digitiform apical. Claw tufts present; superior tarsal claws without teeth. Tarsi I–IV scopulate, III, IV divided by narrow row of setae; metatarsi I–III scopulate along half their length, metatarsus IV ascopulate. Femur IV without retrolateral scopula. Stridulatory setae absent. Legs I: femur 7.5, patella 3.2, tibia 5.7, metatarsus 5.0, tarsus 3.2, total 24.6, II: 6.4, 3.8, 4.8, 4.3, 3.0, 22.3, III: 5.9, 3.0, 4.3, 5.0, 3.2, 21.4, IV: 8.0, 3.7, 6.7, 7.5, 3.5, 29.4. Spines: tarsi lacking spines. Palpal femur 0, patella 0, tibia v0–1–0; legs I lacking spines; II femur 0, patella 0, tibia v0–0–2(ap), metatarsus v1–0–1; III femur 0, patella 0; tibia v2–2–3ap, p1–1–1, r1–1–0, metatarsus v1–1–3ap, p1–1–1, r1–1–0; IV femur 0, patella 0, tibia v1–1–3(2ap), p1–1–0, r1–1–0, metatarsus v2–1–3ap, p1–1–1, r1–1–0. Tibia I thickened. Male spur with two closely positioned straight branches originating from common, raised base. Retrolateral branch longer than prolateral. Both branches narrow, tapering slightly to distal portion, bearing very narrow spine contiguous to each branch on internal face. Metatarsus I bent at basal portion, with ventral spur on distal third portion, touching laterally retrolateral branch of tibial spur when flexed. Male palpal bulb with short subtegulum, not extending down bulb. Bulb globose, narrowing abruptly, giving origin to very long embolus, longer than palpal tibia. Male palpal bulb keels absent. Urticating hairs absent. General color pattern golden-brown. Carapace, abdomen and legs covered with golden hairs. Leg rings and longitudinal stripes on patellae and tibiae hardly distinct.

Female: (IBSP 8693, Votuporanga, São Paulo, Brazil, July 1995, Palinger, F. leg., ova-



Figures 1–6.—*Sickius longibulbi*, male, IBSP 8019, Paranaíba, Mato Grosso do Sul, Brazil: 1. Left male palpal bulb, retrolateral view; 2. Same, prolateral view; 3. Left palp; 4. Left leg I, retrolateral view; 5. Same, ventral view; 6. Maxillae, labium and sternum. Scale lines = 1 mm.

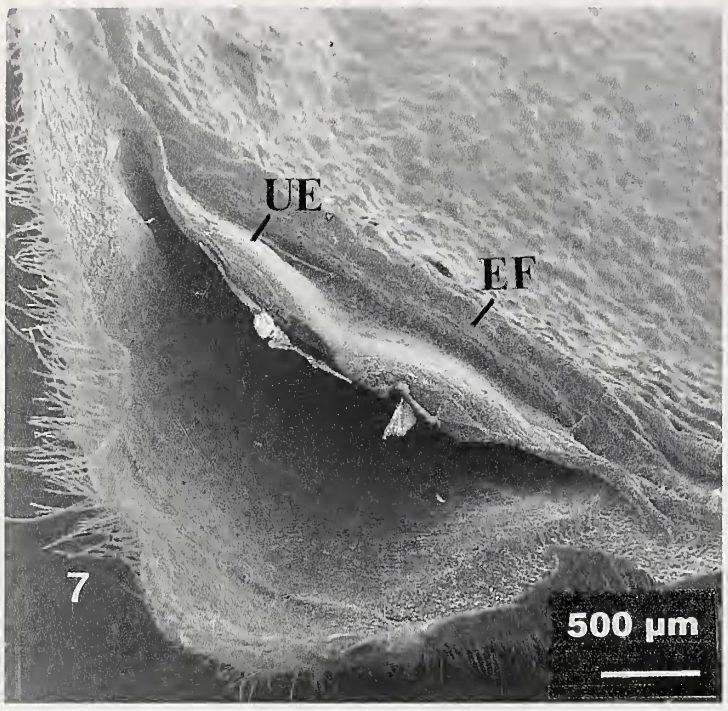


Figure 7.—*Sickius longibulbi*, female, internal genital area showing epigastric fold (EF) and uterus externus (UE).

ries and oviducts dissected). Total length with chelicerae: 25.7. Carapace: length 9.8, width 8.2. Eye tubercle: length 1.1, width 2.0. Labium: length 1.3, width 1.7. Sternum: length 4.5, width: 3.9. All characters as in male, except: both basal segments of chelicerae with 11 teeth on promargin; tarsi I–IV scopulate, all divided by narrow row of setae, more evident on tarsi III, IV; metatarsus IV scopulate on apical third; palpal tibia not thickened. Legs I: femur 8.0, patella 4.3, tibia 5.6, metatarsus 4.8, tarsus 2.7, total 25.4, II: 6.6, 4.0, 5.1, 4.3, 3.2, 23.2, III: 5.9, 3.5, 4.3, 5.4, 3.5, 22.6, IV: 8.2, 4.0, 6.9, 8.0, 3.5, 30.6. Spines: tarsi lacking spines. Palpal femur p0–0–1, patella 0, tibia v0–2–3ap; legs I femur p0–0–1, patella 0, tibia v0–0–2ap, metatarsus 0; II femur p0–0–1, patella 0, tibia v0–1–2ap, metatarsus v1–0–1ap; III femur r0–0–1, patella p1; tibia v1–0–3ap, p1–1–1, r0–1–1, metatarsus v1–1–3ap, p1–1–1, r0–1–1; IV femur r0–0–1, patella 0, tibia v2–1–3ap, p0–1–0, r1–1–0, metatarsus v2–1–3ap, p1–1–1, r1–0–1. Urticating hairs absent. Spermathecae absent.

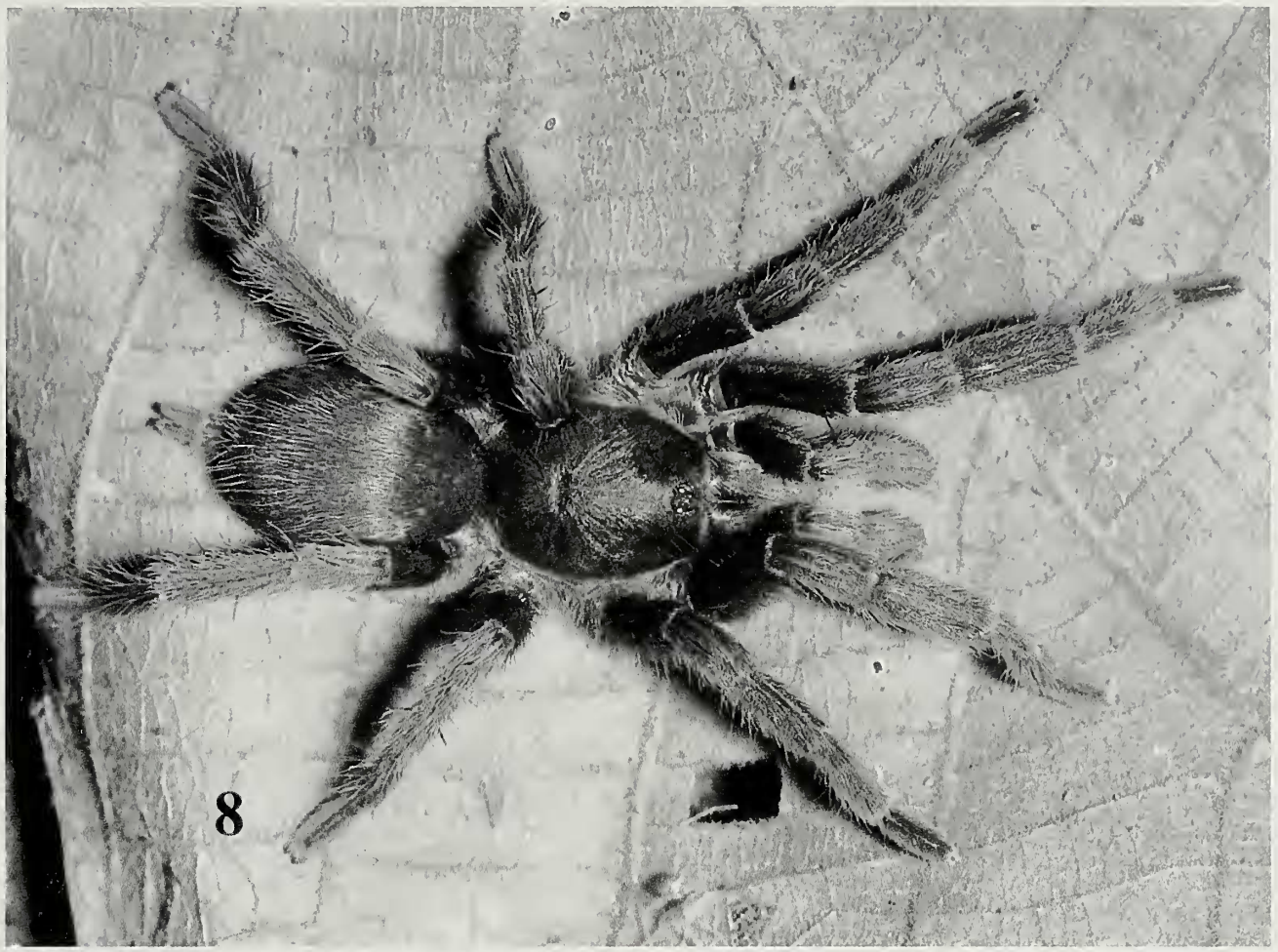
Natural History.—*Sickius longibulbi* lives under rocks and fallen logs, sometimes digging shallow burrows that are filled with silk strands.

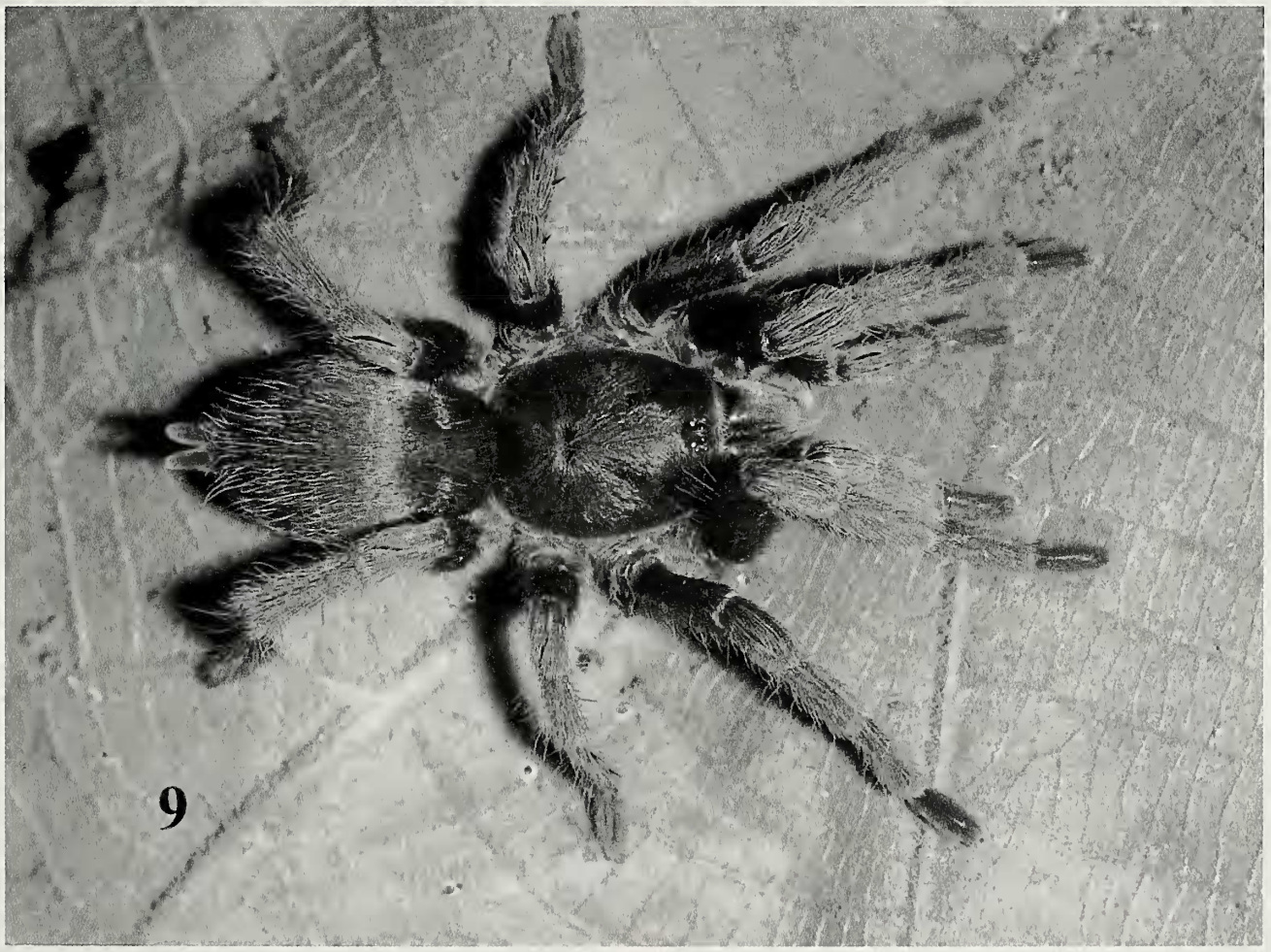
Remarks on the holotype.—The male copulatory bulbs, which are normally used in species identification, are missing. However, the unique conformation of the tibial apophysis, the presence of a metatarsal ventral apophysis, and the original published figure of the male palpal bulb confirm the holotype's identity.

Soares & Camargo's (1948) description stated that in the holotype the sternum is much longer than wide and tapers slightly backwards, as confirmed by our examination of the specimen. However, this simply seems to be a condition occurring after ecdysis, since we have observed the same sternal shape modification in a few other specimens belonging to well-known species of the families Nemesidae and Theraphosidae. The sternum in the other studied *S. longibulbi* specimens is just slightly longer than wide (Fig. 6).

Distribution.—*Brazil:* Eastern State of Mato Grosso to the Distrito Federal, and south to the States of Mato Grosso do Sul, State of São Paulo, and western State of Paraná, apparently following gallery forest of the valleys of the rivers Araguaya and Paraná as well as the Atlantic semi-deciduous forest of the States of São Paulo and Paraná.

Additional material examined.—BRAZIL: *Distrito Federal:* Brasília, inside termite's nest of *Armitermes euamignathus*, campus of Universidade de Brasília, 1 ♂, 3 ♀, 1 juvenile, 26 April 2000, P.C. Motta (UNB 985). *Mato Grosso do Sul*: Coxim, 1 ♂, 1 ♀, 20–21 December 1986, E.G. Soave (IBSP 8017). Piraputanga, 4 ♂, July 1999, A.D. Brescovit (IBSP 8059, 8820). Paranaíba, 1 ♂, 1 ♀, 21 January 1983, R.R. Silva (IBSP 8023, 8024); 1 ♂, 3 ♀, 25 August 1983, R.R. Silva (IBSP 8021, 8018). Bandeirantes Island, Paraná River, between Brasilandia, Mato Grosso do Sul State and Presidente Epitácio, São Paulo, 2 juveniles, 2 ♂, 1 ♀, 21 July 2000, R.P. Indicatti & M.S. Sebastião (IBSP 8709, 8718, 8681, 8717, 8819); 1 ♀ (dissected), July 2000, 1 ♀, August 2000, Equipe Resgate de Fauna (IBSP 8813, 8834); 4 juveniles, 3 July 2000, F. Cunha & C.A.R. Souza (IBSP 8635); 1 juvenile, 1 ♀ (dissected), 5 July 2000, C.A.R. Souza (IBSP 8719, 8818); 1 ♀, 1 juvenile, 3 August 2000, Candiani, D. & C.A.R. Souza (IBSP 8629); 1 ♂, 3 ♀ (IBSP 8720, 8710, 8627, 8631), 1 juvenile, 26 July 2000, I. Knysak & R. Martins (IBSP 8598). *São Paulo*: Guaraci, 1 male, 1 September 1993, Santos, J.J. (IBSP 8022). Votuporanga, 1 ♂, 2 ♀ (dissected), July 1995, Palinger, F. Ded. (IBSP 8821, 8814, 8816). Itirapina, 3 ♂, 2 ♀, 13 October 1999, 6 ♂, 12 October 1999, Oliv-





Figures 8–9.—*Sickius longibulbi*. 8. Male; 9. Female.

eira, M.E. (IBSP 8791, 8695, 8694, 8696, 8793). São Luis do Paraitinga, 1 ♂, 16 October 1983, Dardi, L. C. (IBSP 8020). Rosana, U.H.E. Rosana, Paranapanema River, 1 ♀, December 1986, Equipe de Resgate de Fauna (IBSP 8822). *Paraná*: Pinhão/Candoi, U.H.E Segredo, Rio Jordão, 10 ♂, 6 juveniles, 14 ♀, 01 May 1996, Equipe de Resgate de Fauna

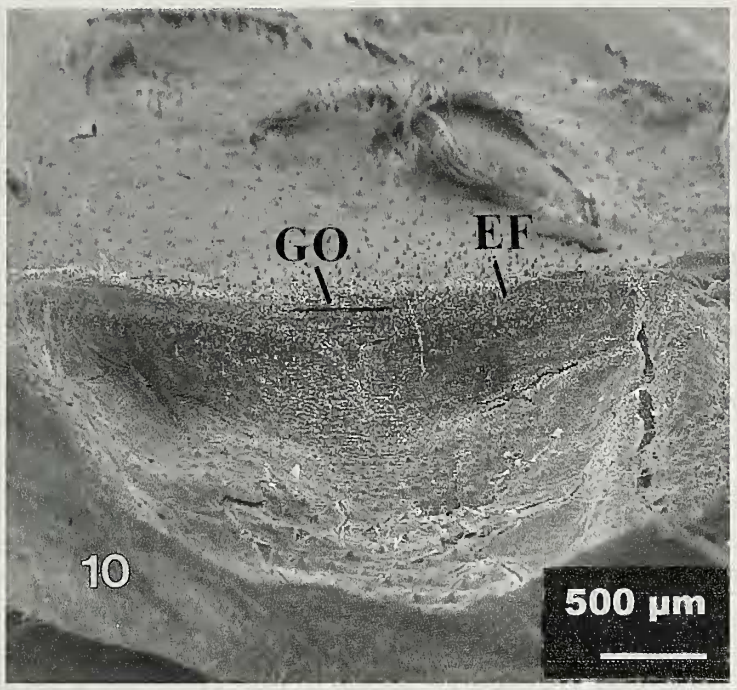
(IBSP 8810, 8823, 8812, 8808, 8829, 8811, 8826, 8824, 8825, 8828, 8827, 8809); 1 ♀(dissected), 1996, Chagas-Junior, A. & Montingelli, G. (IBSP 8815).

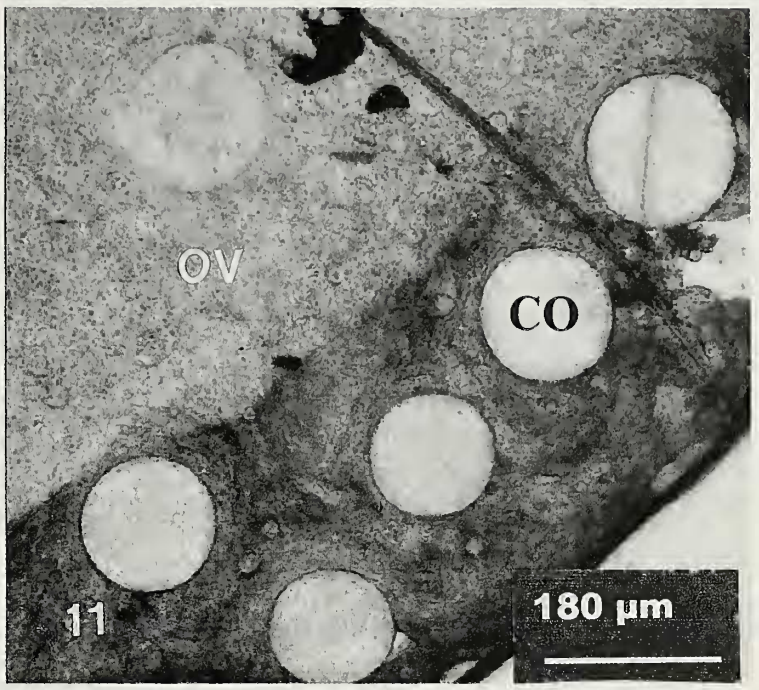
Taxonomic remarks.—*Sickius* was synonymized with *Hapalotremus* because "they share the tibial apophysis conformation and the associated bent metatarsus" (Raven 1985). However, the type was not located at that time (Raven 1985) and the synonymy was based on published figures. *Sickius longibulbi* has a small subtegulum not extending down the bulb, and lacks both male palpal bulb keels and urticating hairs; therefore, it lacks all theraphosine synapomorphies (Raven 1985; Perez-Miles et al. 1996) and thus cannot be included in the theraphosine genus *Hapalotremus*. It is here included putatively in Ischnocolinae, because it lacks the synapomorphies for the remaining theraphosid subfamilies. Ischnocolinae is probably a paraphyletic assemblage considered as "incertae sedis" by Raven (1985).

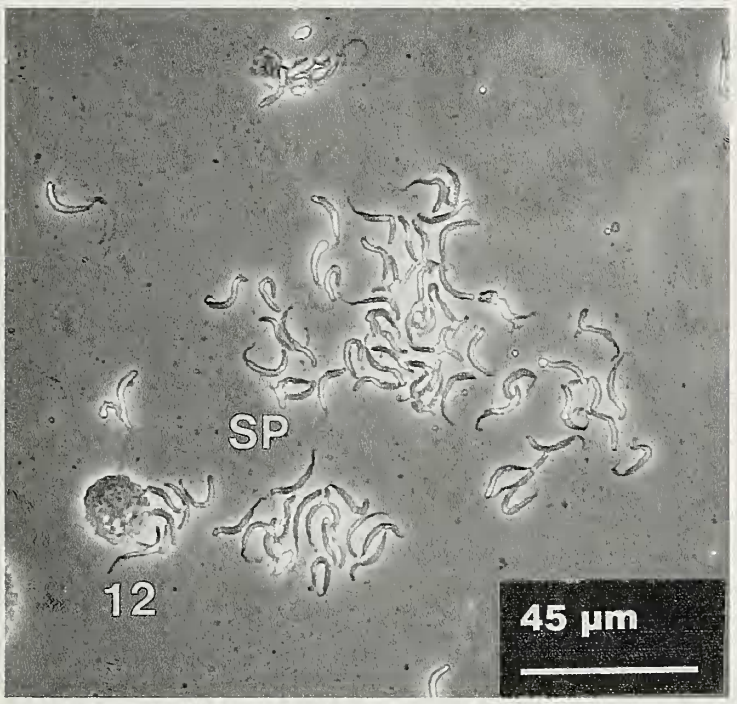
The unique conformation of the male palpal bulb, the unusual shape of the male tibial apophysis and the presence of a metatarsal ventral apophysis on leg I of male (Figs. 1–5), as well as the absence of female spermathecae (Fig. 7), easily distinguishes the genus from other ischnocolines. On the other hand, these extremely derivative characters, not shared with any of the other ischnocoline genera, makes relationship comparisons difficult.

Female genital morphology.—Apart from some species of the families Liphistiidae, Diguetidae, Archaeidae and the Pholcidae (Forster 1980; Uhl 1994), all other spider species have spermathecae, which function to store sperm. In its simplest conformation, called haplogyne, a region or regions of the uterus externus (also called bursa copulatrix) is invaginated to form the receptaculum or spermatheca, which is surrounded by secretory tissue (Forster 1980). Both the uterus externus and spermathecae are chitinous structures, easily seen in dissected females, both adult and immature, of most species. In Mygalomorphae, in which females continue to molt after reaching maturity, the cuticular lining of the spermatheca is shed with the exuvium. In most theraphosid species, spermathecae appear early in development. Galiano (1984) stated that in *Acanthoscurria sternalis* Pocock 1903 the spermathecae are visible in the sixth exuvium, when the prosoma is only 3 mm long, or 1/6 of the adult length, which occurs after 209–277 days of life. Stradling (1978) found spermathecae in *Avicularia avicularia* (Linnaeus 1758) specimens less than a year old and probably in the fifth or sixth instar. Therefore, it is clear that spermathecae are absent in *Sickius longibulbi*, since we did not find such a conspicuous structure in the dissected females or in any of the 90 exuviae examined (some of them belonging to females which constructed fertile eggsacs in captivity). Additionally, two females constructed fertile eggsacs 14 months after they were collected; and, interestingly, they had molted twice before eggsac construction. Because the molting process surely would lead to loss of the spermathecae together with the sperm mass in their contents (Foelix 1996), this supports the observation that spermatheca are absent in mature females. Contrary to females which bear the uterus externus (Fig. 7), immature males have a small genital opening (Fig. 10).

The question that arises then is, where is the sperm mass stored? In all living species lacking spermathecae, the families Liphistiidae, Diguetidae, Archaeidae and representatives of the Pholcidae, the sperm is stored in the uterus externus, a condition considered primitive (Forster 1980). In these cases, the wall of the uterus externus is associated with secretory glands which open through numerous pores across the surface of the genital tract (Forster 1980; Uhl 1994). In pholcids, spermatozoa are embedded in the female secretion, which serves to store and fix the sperm mass in a specific position within the uterus externus itself (Uhl 1994). In order to examine this possibility, two females had their genital tract examined to look for the site of sperm storage: a preserved female with large abdomen and well-developed oocytes, which was considered a sign of pregnancy; and a female which was sacrificed and dissected eighteen hours after copulation had taken place. Ovaries, oviducts, uterus internus and uterus externus were examined under a stereomicroscope and samples of structures resembling coenospermia were taken from oviducts and the uterus internus lumen. Under light microscopy it was confirmed that they were coenospermia, i.e., the multicellular sperm capsules found in mesothele and theraphosid spiders (Alberti et al. 1986) (Figs. 11, 12). As







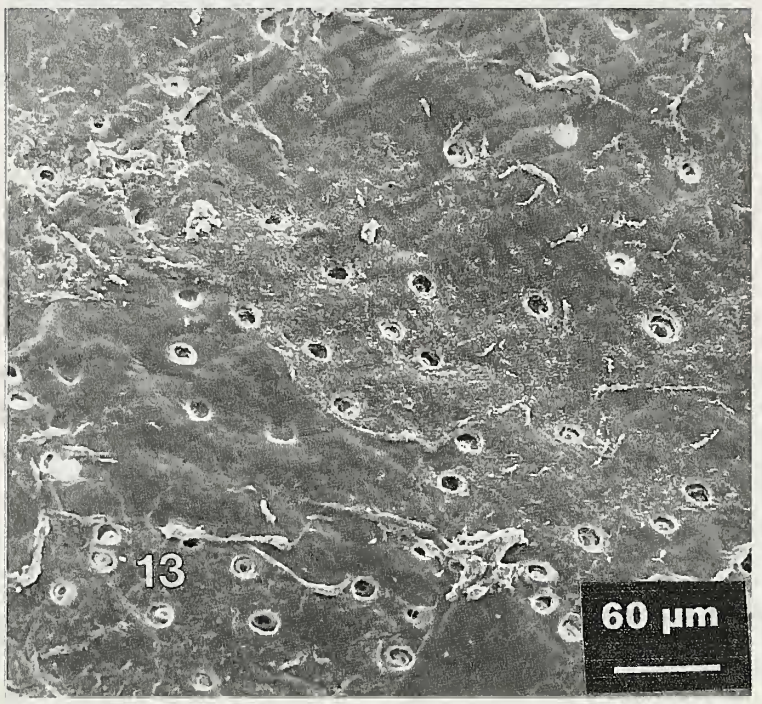


Figure 10–13.—*Sickius longibulbi*: 10. Male exuvium showing internal genital opening (GO) and absence of uterus externus. EF = epigastric fold; 11. Part of oviduct (OV) showing coenospermia (CO) inside its lumen; 12. Free spermatozoa (SP) from a ruptured coenospermium; 13. Female uterus externus posterior wall showing the presence of pores (P).

in *Pholcus phalangioides* (Fuesslin 1975) (Uhl 1994), the posterior wall of the uterus externus possesses pores (Fig. 13), but these were less numerous and more evenly spaced over the surface. However, unlike pholcids (Uhl 1994), no sperm mass was found fixed to the uterus externus wall. Detailed reports on mating behavior as well as on the morphology of female reproductive organs are in preparation by the authors.

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